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ABSTRACT

A computer system developed as a database access facilitator for the blind is found to have application to foreign language instruction, specifically in teaching French to speakers of English. The computer is programmed to translate symbols from the International Phonetic Alphabet (IPA) into appropriate phonemes for whatever language is being learned. In the case of French, the resulting "vocalization," while not efficient enough to be a good guide to the details of French pronunciation, is conducive to the construction of exercises designed to teach phoneme-grapheme correspondence. A table of rules for translation from French text to the IPA offers the advantage of presenting the graphical-sound correspondences of standard French in a very concise manner, with only a few constraints. The insertion of a frequency list of the 5,000 most used words in French makes the program further conducive to a great variety of exercises involving vocabulary learning. (JB)

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POSSIBLE PEDAGOGICAL APPLICATIONS OF A TALKING COMPUTER TERMINAL FOR THE FRENCH-SPEAKING BLIND* TO FOREIGN LANGUAGE TEACHING

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Voice output from computer terminals linked to an educational computer system is useful in instruction in many subjects, important in the teaching of foreign languages, and almost essential for computer use by the blind. Peter Maggs at the University of Illinois and the author have developed a computer terminal containing a microcomputer system programmed to turn ordinary French output from a host computer into spoken French using a speech synthesizer. The quality of the natural language to phonetics translation and of our systems development software is better for the French version than for an English one developed earlier by Prof. Maggs.

The English version of the terminal has been tested for over two years in a wide variety of applications including access by blind lawyers to a data bank of legislation and court decisions of the United States Department of Justice (Maggs, 1979). The micro-computer programs, used by both terminals, have a common structure as far as the phonetic transformations are concerned. This structure was originally developed for English at the United States Naval Research Laboratory (Elowitz, 1976). The French program first

*Joint-Project with Prof. Peter B. Maggs at the University of Illinois at Urbana-Champaign.

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translates French into the International Phonetic Alphabet (I.P.A.) - the algorithm is written in code executable on the Z-80 8080, or 8085 micro-processor, and can therefore be easily adapted to run on a variety of microcomputers - and then translates from the I.P.A. to the phonetic and intonation codes for a given brand of synthesizer using a translation table for that synthesizer. Testing has so far been with the VOTRAX VS-6 American English synthesizer which has a speed limited to a maximum of 160 words per minute and does not reproduce French nasals and the French [y] , and with the new VOTRAX VS-B French synthesizer which has a much higher top speed and produces all of the phonemes. Unfortunately, in the near future, the quality of the text spoken by the machine, while adequate for use by the blind, will prevent its use for the teaching of listening comprehension and, naturally, pronunciation. It is rather in the visual aspect of the program, and in particular in the use of the translation table from French text to I.P.A. symbols that the program developed for the talking computer terminal for the blind can be effectively used in foreign language (FL) teaching. We will here discuss possible applications to French language instruction in the areas of phonetics, orthography, phonology and the lexicon.

1. French phonetics - The table of rules for translation from the source natural-language text to the I.P.A. can indeed be used

to introduce students to this alphabet, to the rules of French pronunciation and to the recognition of sound patterns represented by the graphic forms.

1.1 I.P.A. Symbols - Our program make use of all phonemes of Modern French with the exception of the nasal vowel /œ̃/ and of the traditional posterior /ɑ/, both disappearing from the inventory of many French speakers. We have also, for the time being, transcribed non-final mute e bv the open mid-vowel /ø/.

Students can first be given a short oral presentation of the I.P.A. symbols necessary to describe the sound system of French or they can be induced to find the sound-symbol correspondences by typing lists of minimal pairs, short words, and, finally, longer lexical items whose transcription in the I.P.A. will immediately appear on the screen.

1.2 Sound-symbol Correspondence - The possibility of immediate transcription in the I.P.A. of each word typed is conductive to various exercises aimed at the identification of graphic symbol-sound symbol correspondences and even at a triple sound-written form - I.P.A. correspondence. That is, as above mentioned, students are asked to type lexical items - or whole sentences - given in their written forms. These items can also

be given in their oral forms or be part of an oral message recorded on tape. The listeners will then have to associate correctly sound and graphic form, and this will be reinforced in a third phase by the appearance on the screen of the I.P.A. representation.

One could even construct a four-step exercise in which the learner is given an oral taped message, whose written form he then has to recognize in order to type it. If the answer is correct the tape will repeat the oral utterance in order for the student to practice its pronunciation. If not, he has to retype the utterance given till, with possible help, he arrives at the correct transcription. There is however in that case the possibility of having a correct phonetic transcription despite a faulty orthography in the case of homophons (ex.: mot would be correctly transcribed /mo/ even if spelled maux). Practice could then bear on whole sentences. In this type of exercise, however, the perception of the oral message and the pronunciation of it would be stressed rather than the sound-graphic forms correspondences which could be practised from a script as previously seen. This last type of exercise, whose starting point is the written message, would indeed lend itself to the study of different spelling combinations corresponding to the same sound (ex.: /o/ is represented by the letter o

as well as other combinations: eau, au, etc...). Exercises on series of homophones would be revealing in that regard.

1.3 Specific Problems - Exceptions - Furthermore, through access to the translation table from French text to I.P.A., students have the opportunity of becoming acquainted with some major problems of pronunciation due to "irregular" correspondences between a sound and its graphical form.

Access is thus immediate to all exceptions to the more general rules of pronunciation among a frequency list of some 5000 words. At the beginner's level could be taught only those exceptions to be found in Basic French, for instance in "Le Français Fondamental 1er Degré". (See List I).

The program also allows for a possible efficient treatment of word final -ent at the beginner's level. Our ad hoc rules have all monosyllabic words listed (cent, rent, dent, lent) and most adverbs in -ment as well as a list of 48 items with non mute final -ent whereas the final -ent remains unpronounced in all other cases, that is in verb endings. In the case of non verbs, students will early learn to pronounce the ending of adverbs in -ment for instance as part of exercises of formation of adverbs. For other adverbs, nouns and adjectives where final -ent is pronounced, the

list of such common words listed in the tables would be helpful in order to draw the learner's attention on the pronunciation of the ending of these words. (See List II).

In the same way, a list of non verbs ending in -er could focus the attention both on the fact that a few items differ in their pronunciation from all other words ending in -er (avant-hier, cher, mer, hiver, fer, fier, enfer, ver, amer, revolver). It would also be helpful in stressing the different pronunciation of the feminine form of adjectives in -er and of those nouns in -er having a feminine form, the most common being étranger, ouvrier, romancier, prisonnier, héritier, conseiller, aventurier, sorcier. (See List III). One could finally point to the same change in the pronunciation of final -er in adjectives involved in liaison that is, mainly with premier, dernier, léger. The list of non verbs in final -er as well as the program rules for that ending thus further illustrates the possibility of devising effective exercises involving both pronunciation practice and vocabulary acquisition. The above mentioned cases could, besides, be considered as part of the more general problem of the treatment of final consonants which is dealt with in our first table.

In conclusion, the table of rules for translation from French text to the I.P.A. offers the advantage of presenting the graphical-sound correspondences of standard French in a very concise manner. The table, which can appear on the screen with rules alphabetically ordered or from which specific rules can be selected, thus lends itself to numerous exercises aimed at the learning of text to sound equivalences or vice-versa. Its conciseness - some 600 programming rules than can be printed on 4 pages - is particularly well suited for pedagogical purposes. As such it would likely lend itself equally well to the teaching of pronunciation and orthography, and could be most effectively exploited in a reading course as well as in a remedial course in the first language centered on orthography. Finally, the simplified representation of the sound system of Modern French that has been adopted - based on recent linguistic analysis - is pedagogically exploitable. At an advanced level discussion of the decisions taken to simplify the system can prove instructive fruitful, for instance the non-inclusion of /ɑ/ and /œ̃/ and the rules regarding the use of /e/ vs /ɛ/, /ø/ vs /œ/, and /o/ vs /ɔ/. However, the most useful application of the computer program may well lie, besides being used to teach spelling to native speakers of French, in its use for teaching the I.P.A. symbols together with graphical and sound recognition of the words of the second language. As such the computer, even without

its talking component, may offer a solution to the ever difficult problem hinted at by Joel Walz (1980:431) in a recent issue of the French Review when he writes: "The best way to reduce and stabilize students' inventory of phonemes is to study and use the phonetic alphabet. However, this would require an additional investment of time and effort". By making use of the computer, however, the teaching of the phonetic alphabet may be integrated with the teaching of the skills instead of appearing as a pointless time consuming end in itself.

2. Phonology - As already stated, the table of rules allows the oral reproduction of any French text with the only constraints that words not conforming to the general rules of French pronunciation, and not listed as exceptions in the program, will be incorrectly transcribed - that is all words whose pronunciation cannot be reduced to rules and whose listing in the program would not be time and cost effective considering their overall low frequency. The table of rules can therefore be used to focus on specific sets of rules in order to study major points of French phonology such as the treatment of semi-vowels, and exercises involving the application of such rules could be built to that effect based on either an inductive or deductive approach to the point discussed. From a pedagogical point of view, the

sets of rules for each problem (semi-vowels, mute e deletion, liaison, etc...) offer an interesting perspective since the main criteria behind the conciseness of the rules were simplicity and frequency. Rules for liaison are particularly interesting in that regard and study of the decisions made in order to give a simplified representation of liaison could bring about interesting discussions in the classroom. At an advanced level one could create a course based on the theoretical foundations underlying a program for talking computer output. The aim of the course would be to study the output resulting from the rules of the computer program, and come out with suggestions as to its possible improvement. This would necessarily lead to consider theory and direct applications of it, and be highly motivating to boot.

3. Vocabulary - It is certainly in the teaching of vocabulary, per se or in relation to morpho-phonological rules, that the computer program - as is or as could be easily modified - can be an immediate and useful tool in FL teaching. The insertion of a frequency list of the most used words in French - some 5000 in the one by Juilland we used - is conductive to a great variety of exercises involving vocabulary learning. The possibility of using any such list, for instance Le Français International or words belonging to technical vocabularies

increases the adaptability of the machine as a teaching tool since it can be geared to definite categories of learners with distinct objectives and needs. Possible exploitation of the program can be best illustrated in the particular case of adjectives with a marked gender. In his recent study on pronunciation errors, J. Walz again drew our attention to the fact that "The study of adjectives and verbs in particular requires accurate pronunciation". We will point out here to the manner in which the first problem can be treated in computer assisted instruction. Based on A. Rigault's classification, adjectives whose feminine form is marked by the pronunciation of the final consonant can be grouped in the following way:

I - The final vowel remains unchanged

A. Final consonant /t/

1. Adjectives in -ant
2. Adjectives in -ent
3. Adjectives in -uit
4. Adjectives in -ait
5. Adjectives in -it
6. Adjectives in -eint
7. Adjectives in -oint
8. Adjectives in -ert (/rC/ vs /r/)
9. Adjectives in -et*

*For adjectives in -et as well as for those in -aid, -ais, -ait, there is no modification of the final vowel if this one - as in our program - is an open one in the open (masculine) syllable.

Also: petit, haut, fort, droit, immédiat, plat, ingrat, saint, maint, prompt and, with two accepted pronunciation, distinct.

B. Final consonant /z/

1. Adjectives in -eux
2. Adjectives in -ais
3. Adjectives in -oux
4. Adjectives in -is

Also: confus, clos.

C. Final consonant /d/

All adjectives in -and, -ond plus chaud, laid, grand, second, allemand, profond, chaud, rond, blond, laid, normand, fécond, and also bavard (/rC/ vs /r/).

D. Final consonant /s/

Gros, doux, bas, épais, gras, las, roux, divers and épars (/rC/ vs /r/).

Not belonging to the above groups are:

long, blanc, franc, frais, gentil.

II - The final vowel does not remain unchanged

A. Modification of the vowel:

The word idiot and the adjectives in -er.

B. Changement in the vowel:

fou, mou, beau, nouveau, vieux.

III - (De) nasalization process: masculine in /ɛ̃/

A. /ɛn/ vs /ɛ̃/

1. Adjectives in -ain

2. Adjectives in -ein

3. Adjectives in -en

and the word: bon

B. /in/ vs /ɛ̃/

Divin, latin, féminin, marin, mesquin and malin

(/ / vs / /).

C. /yn/ vs /œ̃/

To reflect modern French pronunciation, the final vowel of the masculine form has been transcribed /ɛ̃/ in our program instead of /œ̃/.

aucun, commun, brun, opportun.

To the above categories must be added adjectives showing an /f/ - /v/ opposition that is adjectives in -if, and bref, neuf. Also, with modification of the vowel (/œ/ vs /ø/), the ending

-eur/-euse of flatteur, is more productive in nouns. Precisely, the above classification could be used for the study of the gender in nouns.

In general terms, the study of adjectives with a marked gender would show how the handy implementation of a series of exercises designed for the teaching and learning of a specific problem is made possible through easy access to a frequency list of the most common words in French, and to a table of rules translating from French text to I.P.A. The adjustability of such a vocabulary list to the objectives of the course, the use of the frequency, when given, for the progression of the materials, and the possibility of grouping lexical items by word classes - as done, sometimes questionably, in Juilland's list - make possible a great variety of exercises. The fact of having each item of the list followed by the word class to which it belongs allows, as above mentioned, to construct exercises on the gender of nouns on the model of those on adjectives with a marked gender.

The computer program thus appears to be three dimensional - lexically, grammatically and morphophonologically speaking - in its applications to language teaching. Consequently, an optimum (pedagogical) efficiency will be achieved by making full use of the lexical and phonological dimensions, and by

possibly adding to these a grammatical one. For example, the use of the computer would enable the simultaneous study of adjectives as a vocabulary problem (the learning of new items drawn from a frequency list together with their pronunciation) as a grammatical problem (the word class of adjectives with its morpho-syntactic characteristics and ensuing possible differences in orthography or pronunciation with words of other classes) and as morphophonological problem (gender, inflection, liaison).

The present quality of synthesized speech does prevent talking computer terminals from being the ideal tool in the teaching of communicative skills such as speaking and listening. However, as is, without speech even, and with possible improvements in the treatment of liaison and above all mute e deletion, the computer might well be ~~the~~ an efficient way of preparing the language learner for the later phase of FL learning whether aimed at oral communication or not.

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List I

cocktail
août
cueil-
tabac
caoutchouc
porc
sud
est
ouest
hier
vers
cher
mat
hiver
fer
fier
enfer
ver
amer
revolver
sept
clef
nerf
boeuf
oeuf
hall

gentilhomme
ville/mille/tranquille
gentil
fusil
outil
fils
automne
monsieur
parfum
sens
jadis
mars
hélas
(auto)bus
os
aigui-
linguist-
fais-
plomb
cap
gare
six
second/deuxième
soixante
gaz

LIST II.

LESSON NUIAL AT 7:44 AM ON WEDNESDAY, APRIL

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660 *** WORDS IN ENT EXCEPT ADVERBS IN MENT ***
661 CENT NUM. 381
662 MOMENT N. 299
663 SOUVENT AV. 212
664 MOUVEMENT N. 202
665 DIFFE¬ERENT AJ. 134
666 GOUVERNEMENT N. 121
667 E¬ELE¬EMENT N. 116
668 ARGENT N. 107
669 SENTIMENT N. 98
670 PRE¬ECE¬EDENT AJ. 83
671 PARENT N. 67
672 DE¬EVELOPPEMENT N. 64
673 PRE¬ESENT N. 64
674 VENT N. 64
675 E¬EVE¬ENEMENT N. 61
676 PRE¬ESIDENT N. 61
677 CONTENT AJ. 5
678 PRE¬ESENT AJ. 52
679 CHANGEMENT N. 45
680 AGENT N. 42
681 EXCELLENT AJ. 40
682 DENT N. 38
683 E¬EVIDENT AJ. 37
684 RE¬ECENT AJ. 37
685 APPARTEMENT N. 35
686 MONUMENT N. 35
687 E¬ETABLISSEMENT N. 34
688 JUGEMENT N. 34
689 VIOLENT AJ. 33
690 ACCIDENT N. 32
691 RENSEIGNEMENT N. 32
692 DOCUMENT N. 31
693 INCIDENT N. 29
694 DE¬EPARTEMENT N. 28
695 LENT AJ. 28
696 RE¬UGLEMENT N. 28
697 CLIENT N. 27
698 ENSEIGNEMENT N. 25
699 INSTRUMENT N. 25
700 APPARENT AJ. 24
701 INTELLIGENT AJ. 24
702 PERMANENT AJ. 24
703 RE¬EGIMENT N. 24
704 ACCENT N. 23
705 ARGUMENT N. 23
706 BA¬XTIMENT N. 23
707 GROUPEMENT N. 21
708 INCONVE¬ENIENT N. 21
709 PARLEMENT N. 21
710 TALENT N. 21
711 VE¬XTEMENT N. 21
712 CONSE¬EQUENT N. 20
713 FRE¬EQUENT AJ. 20

714 ORIENT N. 20
715 ARGENT N. 19
716 COMMENCEMENT N. 19
717 ENGAGEMENT N. 18
718 INDIFFE¬EMENT AJ. 18
719 ARDENT AJ. 17
720 INNOCENT AJ. 17
721 PRUDENT AJ. 16
722 RENDEMENT N. 16
723 ACCROISSEMENT N. 15
724 FRAGMENT N. 15
725 RAYONNEMENT N. 15
726 URGENT AJ. 15
727 ABSENT AJ. 14
728 SERPENT N. 14
729 TRANSPARENT AJ. 14
730 APPROVISIONNEMENT N. 13
731 CONSCIENT AJ. 13
732 RAISONNEMENT N. 13
733 TEMPE¬ERAMENT N. 13
734 CLASSEMENT N. 12
735 ALIMENT N. 11
736 DE¬EVOUEMENT N. 11
737 E¬EMINENT AJ. LL
738 PAIEMENT N. 11
739 RE¬ETABLISSEMENT N. 11
740 COMPARTIMENT N. 10
741 DE¬EPLACEMENT N. 10
742 RAVITAILLEMENT N. 10
743 AGRE¬EMENT N. 9
744 CHA¬ATIMENT N. 9
745 COUVENT N. 9
746 E¬ETONNEMENT N. 9
747 LOGEMENT N. 9
748 SOULAGEMENT N. 9
749 TESTAMENT N. 9
750 ARRANGEMENT N. 8
751 BOMBARDEMENT N. 8
752 CIMENT N. 8
753 COMMANDEMENT N. 8
754 EMPLACEMENT N. 8
755 ME¬ECONTENT AJ. 8
756 OCCIDENT N. 8
757 PRE¬ECE¬EDENT N. 8
758 PROLONGEMENT N. 8
759 RAPPROCHEMENT N. 8
760 RELE¬QVEMENT N. 8
761 ARMEMENT N. 7
762 BOULEVERSEMENT N. 7
763 CONTINENT N. 7
764 FERMENT N. 7
765 TOURMENT N. 7
766 TRAITEMENT N. 7
767 VAINEMENT AJ. 7
768 ANTE¬ECE¬EDENT N. 6
769 ATTACHEMENT N. 6
770 AVE¬QNEMENT N. 6
771 E¬ELOIGNEMENT N. 6
772 E¬ELOQUENT AJ. 6
773 ENCHANTEMENT N. 6
774 FERVENT AJ. 6
775 INDULGENT AJ. 6
776 AVANCEMENT N. 5
777 EFFONDREMENT N. 5
778 ME¬ECONTENTEMENT N.
779 PERFECTIONNEMENT N.
780 TORRENT N. 5
781 FONDEMENT N. 4
782 RENONCEMENT N. 4

LIST III LESSON NUIAL AT 7:44 AM ON WEDNESDAY, APRI

385 ********** NONVERBS IN ER ******
386 PREMIER AJ. 567
387 DERNIER ADJ. 332
— 388 HIER AV. 241
— 389 CHER AJ. 168
390 E¬ETRANGER AJ. 104
391 ENTIER AJ. 101
— 392 MER N. 92
393 PARTICULIER AJ. 77
— 394 HIVER N. 75
395 LE¬EGER AJ. 67
396 PAPIER N. 62
397 OUVRIER N. 61
— 398 FER N. 56
399 ME¬ETIER N. 48
400 DANGER N. 44
401 FINANCIER AJ.42
402 E¬ETRANGER N. 40
403 PREMIER N. 40
404 QUARTIER N. 38
405 DI¬NER N. 36
406 OFFICIER N. 35
— 407 FIER AJ. 31
408 OUVRIER AJ. 31
409 PARTICULIER N. 30
410 ESCALIER N. 29
411 RE¬EGULIER AJ. 29
412 ATELIER N. 27
413 SINGULIER AJ. 27
414 E¬ETRANGER N. 26
415 FOYER N. 26
416 DE¬EJEUNER N. 25
417 FAMILIER AJ. 21
418 JANVIER N. 19
— 419 REVOLVER N. 19
420 ROMANCIER N. 18
421 COLLIER N. 17
— 422 CHER AV. 16
423 PRISONNIER N. 16
424 BAISER N. 13
— 425 ENFER N. 13
426 IRRE¬EGULIER AJ. 13
427 CHEVALIER N. 12
428 COURRIER N. 12
429 DERNIER N. 12
430 FE¬EVRIER N. 12
431 GROSSIER A. 12
432 PANIER N. 12
433 DOSSIER N. 11
434 FORESTIER AJ. 11
435 SENTIER N. 11
— 436 VER N. 11
437 ACIER N. 10
— 438 AVANT-HIER AV. 10
439 BANQUIER N. 10
440 CAHIER N. 10

441 CHANCELIER N. 10
442 HE¬ERITIER N. 10
443 PILIER N. 10
444 BRIGADIER N. 9
445 JARDINIER N. 9
446 LAURIER N. 9
447 MILLIER N. 9
448 CONSEILLER N. 8
449 FUMIER N. 8
450 ROCHER N. 8
451 LEVER N. 7
452 LOYER N. 7
453 SOULIER N. 7
454 AVENTURIER N. 6
455 CHANTIER N. 6
456 CRE¬EANCIER N. 6
457 OREILLER N. 5
458 PLOMBIER N. 5
459 SORCIER N. 5
460 CASIER N. 4
461 ORANGER N. 4
462 POLICIER N. 4